

Enabling the Digital Oil Field: The Role of Mobile

How Mobile Technologies can Dramatically Improve Field Operations



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Time for Change

The oil and gas industry has been notoriously slow when it comes to adopting digital technology. Findings from a recent BP survey indicate that 60% of oil executives believe that resistance to change is a key obstacle in helping the industry reap the benefits of the digital oil field.¹ The article summarizes the problem this way: "Oil and gas as an industry is traditional and has tried to stick to the tried and tested strategies rather than attempting to adopt disruptive innovations."

That view is echoed by a research report in the PwC network, "Drilling for data: Digitizing upstream oil and gas," which explains, "The upstream oil and gas sector is well behind other industries when it comes to being digitally enabled. The iconic image of 'roughnecks' — overall-clad workers with oil-stained faces handling equipment on a drilling rig — has not changed much over the past few decades, even as the industry is recognized for its technological innovation."²

This whitepaper looks into what's holding companies back, why the case for moving to digital is so compelling, and how companies can finally make a digital oil field a reality at their organization.

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What is a Digital Oil Field?

"Digital Oil Field" (and "Digital Transformation") has become a buzzword in the oil & gas industry. It's not simply better analyzing the data you collect in the field on paper – that's an incomplete picture.

Ultimately, the Digital Oil Field is about transparent, timely DATA, and lots of it. How much? For example, in a single day, one drilling rig can generate over a terabyte of data; however, in most cases less than 1 per cent of that data is ever analyzed and used for decision-making.³

The digital oil field changes the game by effectively capturing this extensive amount of data, organizing it in a way that can be easily consumed, and actively using it for better daily decision-making. Moving to a digital oilfield centers on better ways to collect, move and analyze data in every aspect of the business. It's about gathering more comprehensive data more quickly from every possible source, analyzing it, and using your findings to improve operating efficiencies and productivity.

Analysis of this vast amount of field data then allows oil producers to:

- **Improve equipment maintenance to avoid failures that impact productivity and safety**
- **Improve business processes and communication throughout the organization**
- **Automate simple tasks and free up workers.**

Reporter and experienced oil geologist Jane Whaley summed it up nicely, "By taking the human out of mundane tasks, productivity is increased, and the expert is freed to use his or her knowledge on more difficult, analytical work."⁴

What's Behind the Slow Adoption of New Technology?

The last few years have been difficult for oil companies. Oil prices have hit all-time lows and remain volatile. When oil prices fall, the upstream companies in particular feel the pain as the costs of production are largely fixed. These companies have had to make big cuts and freeze spending on items such as travel and new IT investments and have watched carefully as the price volatility continues.

At the same time, the industry faces an aging workforce, as a larger number of skilled and experienced oil industry workers hit retirement age. Companies must prepare to backfill a large number of experienced workers about to retire, and as part of the process they must capture best practices to make for smooth onboarding of replacement staff. At the same time, some of these aging workers, are not as comfortable with mobile and IoT tech, which can potentially hinder the success of new innovative technology in the field if user experiences aren't outstanding.

Amid these challenges, oil companies face increasing health, safety and environmental requirements. For example, local and state governments are now introducing more and more bills to restrict where companies can drill, including the most recent debate going on around SB 181 in Colorado.⁵

All these pressures require oil companies to get more insight into real-time field data to maximize

production at every location, increase workforce efficiency, reduce risk and cut costs. Companies can no longer drag their feet, they must digitize more processes and mine this data to streamline processes and maximize ROI on every asset. Digitized data can improve worker productivity, improve safety, reduce risk, and transform timely access to vital information. Now that virtually every field worker carries a mobile phone in his/her pocket, and the price of tablets continues to decrease, companies are in a position to make the digital oil field a reality.

The Case for Going Digital Now

While much of the industry has been reluctant to change, those companies that have been serious about adopting digital technology in the field have seen big payoffs. Shell estimates that the value of its 'Smart Fields' implementation was \$5 billion over five years and the consulting company IHS Cera states that with digital oil fields, **"companies could realize up to 25% savings in operating costs, up to 8% higher production rates, 2-4% lower project costs, and as much as 6% improved resource recovery, all within the first full year of deployment."**⁶

Other oil and gas companies are utilizing digital technologies to do more with less – in this case field workers. Companies are automating processes to increase efficiency and combat skills shortages, hiring and retention challenges and a retiring workforce. Tim Bisley, senior vice president of software for Lloyd's Register, told



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Rigzone recently, "There's an aging population of the workforce who is retiring with a wealth of knowledge and information... We want to digitalize that knowledge and make it available and usable for anybody in the organization."⁷

As companies adopt digital technology, the expected impact on the bottom line is staggering. Energy consultancy Wood Mackenzie reported in 2018 that energy firms could save an annual \$73 billion within five years in oil and gas exploration and production by making better use of existing computing technology.⁸ PwC estimates that "use of digital technologies in the upstream sector could result in cumulative savings in capital expenditures and operating expenditures of US\$100 billion to \$1 trillion by 2025."⁹

The benefits are becoming very clear, but that doesn't mean implementation of a "Digital Oil Field" is a quick and easy task. Digital transformation requires companies go beyond simple technology deployment to change workflows and business processes. Going digital means companies are involving all aspects of the organization that touch this data – rethinking how to collect, share and use that data, and requires companies rethink how they make decisions in a timely fashion. That said, it doesn't have to happen all at once. With the right technologies, companies can start small and begin seeing benefits in weeks.

A light gray speech bubble graphic containing a quote.

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Where to Start

Major oil companies are implementing massive digital oil field projects that include technologies such as IoT sensors that record and transmit readings, high definition cameras that show leaks, and even augmented reality experiments. There's no doubt that the future of the oil field is high-tech; however, companies with limited resources and budgets can take more simple, cost effective steps toward a digital oilfield.

Until now, most data gathered in the field was written down on paper forms and manually input into back-end systems resulting in data entry errors and delayed access to important information. Replacing paper forms with smart mobile apps that capture critical data quickly – by automating the capture of location and time data, etc. Eliminating paper reduces the costs and problems associated with paper forms: printing, scanning, filing, and deciphering scribbles. Capturing new types of data (e.g., images, audio, bar code scans, time and date stamping, digital signatures, etc.) affords the company more accurate operations intelligence. When these mobile apps integrate with existing business systems it makes critical information available immediately to the organization.

Mobile apps are natural expeditors – making everything immediate without the need to pass through multiple people and steps first. As workers complete a task, s/he can kick off another workflow/activity, such as a work order, certification record, or supply order, at the press of a button.

Mobile apps are already familiar to field workers, with most workers carrying mobile phones on them and using weather apps, industry glossaries, text or email to assist them every day. Mobile apps with embedded business logic and business rules can also go beyond simple data capture and guide workers in best practices. Embedded business logic can help new workers perform like more experienced workers, by having a virtual expert on hand to alert workers to problems, suggest resolutions and ensure that the job is completed properly. A sophisticated mobile app can validate information as its captured, such as safe operating parameters for a well head, ensuring data accuracy and providing the field worker with immediate insights, alerts or next steps, on-the-spot. Embedded business logic can result in less errors and safety issues, and that translates directly to bottom line improvements.

As they take these initial steps toward a digital oil field, companies must consider additional data types in their plans. For example, Internet Of Things (IOT) technology sensors can automatically gather data from your systems in the field. Will your solutions be able to utilize this

type of data? The best strategies will allow for flexibility as your organization matures and needs change.

Build or Buy?

Companies can start with off-the-shelf apps that replace standard oil and gas forms or serve a single purpose, such as a safety inspection or a Gemba walk. No developers are required to build these apps, but these one-off solutions do not allow for deep customization to reflect your unique business processes, or collect your data in the cloud or in an Excel spreadsheet that does not immediately or easily allow other workers or systems to leverage the data in real-time. Additionally, as workers in the field enter data into the app, there's usually no way to validate the information as its captured, conduct custom calculations for the worker, or immediately trigger an alert or workflow in existing business systems. Finally, many of these systems fail when a cell or WIFI signal is unavailable – a very common reality in remote field and platform locations.

So what about custom development? You could find a mobile development agency to build you custom app(s), incorporating all the capabilities and scenarios your organizations might need. While custom development offers the most flexibility, it's not always the best route for oil and gas companies that must decrease costs and move quickly. Custom development requires back-and-forth requirements gathering,

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native development time, multiple reviews, field testing and ongoing updates to incorporate field feedback. This process can quickly eat up valuable time and become cost-prohibitive. Plus, once the firm has built the app(s) for you, you'll need to keep paying them to update the app(s) as your business needs change.

How about building it yourself, or have someone on your team build it? After years of requiring mobile developers to build apps, building business apps yourself is now a reality for a wide range of oil and gas employees. "Low-code app development" solutions now exist that offer templates for safety inspections, Gemba walks, drill head or pumpjack inspections, field dispatch and work orders. Even better, these solutions allow a wide range of users to customize each app, and quickly build new ones to digitize paper forms and other processes. Keep in mind, not all these solutions are sophisticated enough to allow offline operation, integration with your existing systems and rich security -- buyer beware. Oil and gas companies considering low-code development as an option must review important criteria that could dictate success or failure in the field.

Finding the Right App Builder for Your Team

Many low-code app builders claim similar capabilities, but oil and gas companies must consider the conditions that their field workers operate in and look for more sophisticated capabilities that solve these unique industry challenges. While every app you build may not require these capabilities, your overall digital approach is more likely to be successful if you select a solution that doesn't leave you hanging if your app must perform common field activities, such as conducting calculations, operating offline, or initiating alerts.

When evaluating these solutions, look for solutions that can:

- **Utilize mobile device-specific hardware capabilities.** Products should support the use of: camera, specialized detectors, GPS, or local file system storage - which expands the amount of data an app can handle. These data entry capabilities are impossible to deliver through a browser-only experience. That's where the difference between mobile forms and a mobile business app come into play.
- **Support offline work.** A mobile form isn't truly mobile if it can't work when a user is without a WiFi or cell connection, but an offline mobile app is not good enough. Enterprise-grade mobile apps should be able to automatically synchronize stored

information (even large media files) and intelligently handle data conflicts (beyond "last-in wins") when reconnected with the backend system. There should be data persistence when the app is closed or the battery dies, including data not saved to the server. Offline capabilities that only allow you to add records versus reading data from a database for editing or deleting are of limited value.

- **Manage the various rich media types available on mobile devices.** Field workers can take pictures, video or record audio notes on their phones and tablets, so your mobile apps should have these capabilities as well. If the user captures images or audio while offline -- think of an insurance claims adjuster working in a tornado-struck area -- the app must be able to save these larger data files without any difficulty. Only a mobile app that can access the device hardware meets this need.
- **Support stylus annotation and digital ink as a data type.** Users in the field may be doing inspections, taking notes on repairs or editing diagrams. Touch-sensitive drawing experiences are important in all types of field apps.
- **Run cross-platform.** A good rapid app development platform will produce apps that run natively on tablets, smartphones, and the desktop regardless of operating system or screen size. The software will

have careful consideration of how – and how often – an end user will interact with the mobile app on the device.

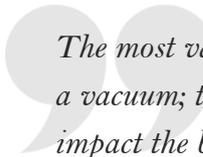
- **Be location-, time-, and mobile-context-aware.** With powerful mapping in their B2C apps, users in the field don't want to waste time opening maps to find an address or inputting a time or location into a data file. Solid business apps should automatically capture important field-level data as part of the experience.
- **Optimize experiences for devices and specific tasks.** This includes capabilities to dynamically produce custom keyboards (such as a digit-only keyboard for numeric entry fields), and apps that require only one hand or a single finger to operate. Ergonomics can be directly designed into the app.
- **Integrate with existing systems of record and workflows.** The most valuable apps do not operate in a vacuum; they drive daily processes and impact the business in real time. Make sure you're producing apps that tie into the systems and processes that already drive your organization.

These criteria offer a great checklist to keep handy while you're evaluating mobile app development products or form builders. However, in situations where requirements go beyond data capture, this list of 5 advanced requirements should be considered. These capabilities turn a

oil field data capture app into a powerful business tool that streamlines field work and drives business in real time. Ask if the product can:

- Scan Bar or QR codes and perform relative look-ups against remote data sources or on-device databases.
- Take advantage of web services.
- Pre-fill data on a mobile app from a corporate system of record.
- Initiate SMS or emails based on calculation or transformations performed on the collected data.
- Create dynamic and filtered picklists for much faster and more accurate data input.

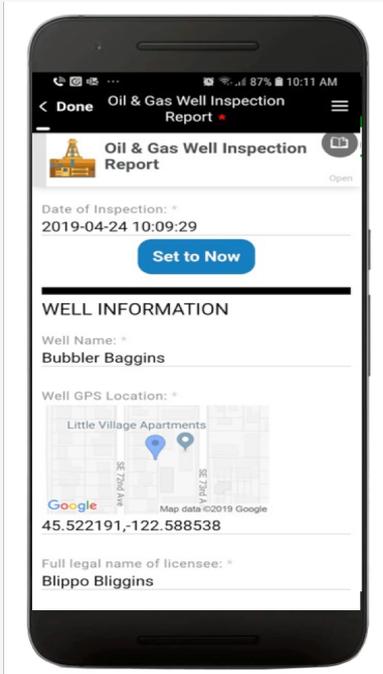
The last thing you need is to introduce a technology that makes recording data in the field harder or builds yet another data source that must be rekeyed or manually uploaded into business systems. Think streamlining processes. Look for systems that tie easily into your processes, have user interfaces that are intuitive to your field workers and how they get work done, and always work offline.

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Conclusion

The time to push off going digital has passed for today's oil and gas companies. New technology innovations have made it possible for oil and gas companies to go digital without spending millions or disrupting the entire organization. By taking advantage of the mobile devices already carried in the field and user-friendly low-code app development, companies can begin to quickly capture more varied and accurate field data. With the right solution that can plug into your existing systems painlessly, you could benefit from your own digital oil field faster than you thought possible.



[Alpha TransForm](#) is an example of a low-code solution with the sophistication required by oil and gas companies. It has the unique ability to rapidly create mobile-optimized forms and field apps that can easily access and integrate with existing databases, company workflows or web services. Apps built with TransForm always work offline – of vital importance for the oil and gas industry where there are remote drilling areas or deep-sea platforms without reliable signals.

Capabilities include:

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